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(54) **APPARATUS AND METHODS FOR DETERMINING WHIRL OF A ROTATING TOOL**

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See application file for complete search history.

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(57) **ABSTRACT**

In one aspect, a method of determining the presence of whirl for a rotating tool is disclosed that in one embodiment includes obtaining measurements ($a_x(t)$) of a parameter relating to the whirl of the tool along a first axis and measurements ($a_y(t)$) of the parameter along a second axis of the tool, determining a first whirl in a time domain for the tool using a_x and a_y measurements, determining a second whirl rate for the tool in a frequency domain from a_x and a_y measurements and determining the presence of the whirl from the first whirl rate and second whirl rate. The method further quantifies the whirl of the tool from the first and second whirl rates.

21 Claims, 5 Drawing Sheets

